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(54) **Device for frothing and heating liquids, such as milk and the like, provided with longitudinal channels for suction of the liquid-frothing air**

Vorrichtung zum Aufschäumen und Erhitzen von Flüssigkeiten, wie Milch oder dergleichen, mit in Längsrichtung angeordneten Kanälen zum Ansaugen von der für die Aufschäumung der Flüssigkeit notwendigen Luft

Dispositif pour faire mousser et chauffer des liquides, tel que le lait ou similaire, avec des canaux longitudinaux pour aspirer l'air nécessaire pour faire mousser le liquide

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<b>EP-A- 0 344 859</b>	<b>EP-A- 0 555 767</b>
<b>DE-A- 3 829 326</b>	<b>DE-A- 3 942 169</b>
<b>DE-A- 3 942 713</b>	<b>DE-U- 8 717 041</b>
<b>FR-A- 2 638 083</b>	<b>US-A- 5 330 266</b>

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**EP 0 813 834 B1**

## Description

[0001] The present invention relates to a device for frothing and heating liquids, such as milk and the like, in particular for automatic machines, which is provided with longitudinal channels for suction of the liquid-frothing air.

[0002] In order to make milk-based hot drinks, such as *cappuccino* and the like, use is made of steam-producing machines, by means of which the milk necessary for preparation of the drink is heated and frothed with air, so as to obtain a surface foam which is quite liked by consumers.

[0003] For this purpose the machines of the known type comprise automatically operating steam heating and frothing devices provided with mixing chambers which have a complex configuration and narrow flow cross-sections and are also equipped with members for micrometric adjustment of the cross-sections themselves, which are difficult to manufacture and difficult to clean as well as being subject, during use, to the formation of milk deposits which alter the values of the preselected cross-sections, resulting in irregular operation of the assembly. Such devices are disclosed into EP 0 195 750 and US-5,330,266.

[0004] In addition to these types of devices, a device for frothing and heating milk for drinks is also known from EP 0,344,859 in the name of the present Applicant, said device comprising a substantially tubular cylindrical body connected to the steam-emitting pipe of a machine for preparing hot drinks, which cylindrical body has inside it a first nozzle, outside of which there is defined, inside the cylindrical body, a chamber in which there emerges a duct for the suction of milk from a container, the said nozzle being located above a constriction extended downwards until it emerges in an extension of the said cylindrical body forming a second nozzle outside of which, inside the cylindrical body, there is defined an annular chamber provided with one or more radial openings communicating with the exterior and an axial passage which places in communication the chamber with the bottom part of the cylindrical body, the second nozzle being placed in communication with the chamber by means of radial holes, through which the frothing air is sucked.

[0005] A similar device is also known from FR-A-2 638 083.

[0006] These devices of the known type have the drawback, however, arising from the fact that, in the case of liquids to be frothed such as milk and the like which have a high density and contain a high percentage of fatty substances, the holes for drawing air from the outside, which are formed radially in the vicinity of the frothing chamber, tend to get blocked up by the milk which tends to bubble out owing to the effect of the pressures existing inside the frothing chamber; in fact, said milk which comes into contact with the air intake hole leaves fatty deposits on the hole itself which tends to

become blocked, gradually reducing the quantity of air sucked in until the desired frothing action no longer occurs.

[0007] In addition, as a result of these outflows of milk, it is necessary to perform frequent cleaning operations both in order to unblock the suction hole and so as to avoid stagnation of fatty substances on the outside of the frothing device, which stagnation may give rise to unhygienic fermentation phenomena. The characteristics of EP 0 344 859 form the basis of the precharacterizing part of claim 1.

[0008] The technical problem which is posed, therefore, is that of providing a device for frothing and heating liquids such as milk and the like, which is provided with means for suction of the air from the outside designed not to come into contact with the liquid to be frothed, thus making it possible to maintain unaltered, over time, the quantity of air sucked in for frothing and avoid the troublesome external outflow of liquid from said suction channels.

[0009] Within the scope of this technical problem a further necessity is that the device should be formed by a reduced number of parts which can be easily assembled and which have a low cost and can be easily washed internally without the need for disassembly thereof.

[0010] These results are obtained by the present invention according to the features of claim 1.

[0011] Further details may be obtained from the following description, with reference to the accompanying drawings, in which:

Figure 1: shows a cross-sectional view, along the plane I-I of Fig. 2, of the frothing device according to the invention associated with a milk container;

Figure 1a: shows a view, in the direction of the arrow "A" of Fig. 1, of the bottom end section of the device according to Fig. 1;

Figure 2: shows a cross-section along the plane indicated by II-II in Fig. 1;

Figure 3: shows a cross-section along the plane indicated by III-III in Fig. 1; and

[0012] As shown in the Figures, the frothing device according to the invention comprises an intermediate body 10 onto which there is engaged an upper body 20 and a lower body 30 onto which an additional tubular element 40 is coaxially mounted.

[0013] Said intermediate body 10 has a substantially cylindrical shape and is provided with a radial connector 11 for engaging one end of a flexible pipe 1, the other end of which is immersed in the container 2 containing the liquid, for example milk 3 to be heated and frothed.

[0014] The pipe 1, moreover, has arranged on it an

element 4 for adjusting the cross-section of the pipe itself, which is provided with a screw 4a by means of which it is possible to adjust the internal aperture of the pipe and hence the quantity of milk 3 to be sucked in, as will emerge more clearly below.

[0015] The bottom part 12 of the said body 10 has a cylindrical shape with a diameter smaller than the top part and with a free end formed in the manner of an annular edge 13 cut longitudinally on one side; said bottom section 12, moreover, has formed in it a radial hole 12a as well as a seat 12b for an annular sealing element 12c.

[0016] The body 10 is internally hollow and has an upper substantially funnel-shaped part with a cylindrical upper part 10a and a lower constriction 10b, while the internal part corresponding to the bottom section 12 is formed as a cylindrical duct 12d.

[0017] The hollow part 10a of the intermediate body 10 has inserted inside it said upper body 20 friction-engaged by means of annular sealing elements 20a. The upper body 20 has a coaxial connector 21 onto which there are engaged, by means of a "T" connection piece 21a, the pipe 22a supplying the steam and the pipe 22b supplying water for internal cleaning of the device.

[0018] The bottom part of the body 20 has a nozzle 23 coaxial with the cylindrical duct 12d of the body 10 which is arranged in the chamber 10a at a location corresponding to both the internal constriction 10b and the connector 11 for suction of the milk 3.

[0019] The intermediate body 10 has fitted to it at the bottom a cylindrical body 30 which has on its external surface two reliefs 31 extending in the longitudinal direction and shaped substantially in the form of a dovetail for engagement with corresponding seats 41 of the said tubular element 40 coaxially sliding on the said cylindrical body 30.

[0020] Said cylindrical body 30 has two radial holes 32 in the upper part and at least two other radial holes 33 in the lower part; as will emerge more clearly below, while the upper holes serve to suck in the frothing air, the lower holes serve to deliver the drink.

[0021] As illustrated in the view shown in Fig. 1a, the tubular element 40 has a bottom end provided with longitudinal eyelets 41 for favouring suction of the air.

[0022] Once the four bodies 10, 20, 30 and 40 have been coaxially assembled, the device has a first chamber 10a where mixing of the steam from the pipe 22a and the milk sucked in by 1 is performed; an underlying annular chamber 50 for introducing the frothing air supplied from the longitudinal ducts 51 and sucked inside the coaxial duct 12d from the holes 32 and 12a.

[0023] With this configuration, the steam, supplied by the pipe 2, is accelerated inside the nozzle 23 of the upper body 30 and produces inside the underlying constriction 10b a vacuum which causes suction into the chamber 10a, surrounding the nozzle 23, of the milk 3 to be frothed, supplied by the pipe 1.

[0024] The sucked-in milk, accelerated inside the steam duct 12d, produces in turn a vacuum such as to

suck in, through the hole 12a, external air which comes from the annular chamber 50 and is supplied to the latter by the longitudinal duct 51 and which flows into the duct 12d through the holes 32 and is diffused in the milk, forming the desired froth.

[0025] The holes 32 and 12d have a fairly large aperture and their diameter is not critical; advantageously they are arranged diametrically opposite so as to avoid, at start-up or stoppage, possible spray passing through them.

[0026] The milk and the froth thus formed therefore emerge inside the chamber 60 of the cylindrical body 30 and from here pass to the outside through the passages 33, therefore being slowed down and homogeneously distributed.

[0027] The dimensions of the nozzle 23, the constriction 10a and the holes 32, 12d are such that they provide a ratio of milk and air, suitable for forming the desired froth; by adjusting the screw 4a of the constriction device 4 it is also possible to modify the quantity of milk sucked in by the steam, thus varying the temperature thereof.

[0028] From Fig. 1 it can be seen also how by intercepting, via known means not illustrated, the steam pipe 22a, upstream of the "T" connection piece, and supplying instead water through the duct 22b it is possible to obtain easy and thorough internal cleaning of the frothing device according to the invention.

## Claims

1. Device for frothing and heating liquids such as milk (3), comprising a substantially cylindrical intermediate body (10) which has sealingly engaged on it an upper body (20) connected to the steam supply pipe (22a) of a machine for preparing hot drinks and provided at the bottom with a nozzle (23), outside which nozzle there is defined, inside the said intermediate body (10), a chamber (10a) in which a duct (11, 1) for suction of the milk (3) from a container (2) emerges, said nozzle (23) being arranged above a constriction (10b) of the chamber (10a), which constriction is followed by a coaxial cylindrical duct (12d) into which there emerge at least one radial hole (12a) introducing the air for frothing the liquid (3), wherein said intermediate body (10) has fitted to it at the bottom an internally hollow cylindrical body (30) on the side surface of which one or more radial holes (32) are formed and onto which there is coaxially fitted a tubular element (40), characterized in that said cylindrical body (30) has projections (31) extending longitudinally on its external surface and designed to be engaged with corresponding seats (41) of the tubular element (40) in order to retain the latter, and in that said tubular element (40) has recesses (51) extending longitudinally and forming longitudinal ducts supplying the frothing air to the said holes (32) for entry into said

cylindrical chamber (12d) of the intermediate body (10).

2. Device according to Claim 1, **characterized in that** said external tubular element (40) has eyelets (41) at its bottom end for favouring the introduction of the frothing air.
3. Device according to Claim 2, **characterized in that** said eyelets are elongated in the longitudinal direction.
4. Device according to Claim 1, **characterized in that** said upper cylindrical body (40) may have associated with it means (21a) for connecting to different supply sources (22a, 22b) in order to supply to the device steam for heating the liquid or water for internal washing of the device itself.

#### Patentansprüche

1. Vorrichtung zum Aufschäumen und Erhitzen von Flüssigkeiten, wie beispielsweise Milch (3), die einen im Wesentlichen zylindrischen Zwischenkörper (10) umfasst, mit dem dichtend ein oberer Körper (20) in Eingriff ist, der mit dem Dampfzuführrohr (22a) einer Maschine zum Zubereiten von Heißgetränken verbunden und am unteren Ende mit einer Düse (23) versehen ist, wobei außerhalb der Düse im Inneren des Zwischenkörpers (10) eine Kammer (10a) ausgebildet ist, in der eine Leitung (11, 1) zum Ansaugen der Milch (3) aus einem Behälter (2) austritt, wobei die Düse (23) über einer Verengung (10b) der Kammer (10a) angeordnet ist und auf die Verengung eine koaxiale zylindrische Leitung (12d) folgt, in die hinein wenigstens ein radiales Loch (12a) austritt, das die Luft zum Aufschäumen der Flüssigkeit (3) einleitet, wobei auf den Zwischenkörper (10) am unteren Ende ein innen hohler zylindrischer Körper (30) aufgepasst ist, an dessen Seitenfläche eine oder mehrere radiale Löcher (32) ausgebildet sind und auf den koaxial ein röhrenförmiges Element (40) aufgepasst ist, **dadurch gekennzeichnet, dass** der zylindrische Körper (30) Vorsprünge (31) aufweist, die in Längsrichtung an seiner Außenfläche entlang verlaufen und die mit entsprechenden Aufnahmen (41) des röhrenförmigen Elementes (40) in Eingriff kommen, um letzteres zu halten, und dadurch, dass das röhrenförmige Element (40) Aussparungen (51) aufweist, die sich in Längsrichtung erstrecken und Längsleitungen bilden, die den Löchern (32) die Aufschäumluft zum Eintreten in die zylindrische Kammer (12d) des Zwischenkörpers (10) zuführen.
2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** das äußere röhrenförmige Element

(40) Öffnungen (41) an seinem unteren Ende aufweist, die das Einleiten der Aufschäumluft erleichtern.

3. Vorrichtung nach Anspruch 2, **dadurch gekennzeichnet, dass** die Öffnungen in der Längsrichtung gedehnt sind.
4. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** mit dem oberen zylindrischen Körper (40) eine Einrichtung (21a) zum Anschliessen an verschiedene Zuführquellen (22a, 22b) verbunden sein kann, um der Vorrichtung Dampf zum Erhitzen der Flüssigkeit oder Wasser zum innerlichen Spülen der Vorrichtung selbst zuzuführen.

#### Revendications

1. Dispositif pour faire mousser et réchauffer des liquides tels que du lait (3), comprenant un corps intermédiaire sensiblement cylindrique (10) sur lequel un corps supérieur (20) est en contact étanche, ce corps supérieur étant connecté au tube (22a) d'alimentation en vapeur d'une machine pour préparer des boissons chaudes et étant muni en bas d'une buse (23), une chambre (10a) étant définie à l'extérieur de cette buse, à l'intérieur dudit corps intermédiaire (10), chambre (10a) dans laquelle émerge un conduit (11, 1) pour l'aspiration du lait (3) depuis un réservoir (2), ladite buse (23) étant agencée au-dessus d'un rétrécissement (10b) de la chambre (10a), ce rétrécissement étant suivi d'un conduit cylindrique coaxial (12d) dans lequel émerge au moins un trou radial (12a) introduisant l'air pour faire mousser le liquide (3), dans lequel ledit corps intermédiaire (10) présente, de façon ajustée avec lui au fond, un corps cylindrique interne creux (30) sur la surface latérale duquel un ou plusieurs trous radiaux (32) sont formés et sur lequel un élément tubulaire (40) est ajusté coaxialement, **caractérisé en ce que** ledit corps cylindrique (30) présente des saillies (31) s'étendant longitudinalement sur sa surface externe et étant conçues pour venir en contact avec des logements correspondants (41) de l'élément tubulaire (40) de façon à retenir ce dernier, et **en ce que** les éléments tubulaires (40) présentent des renforcements (51) s'étendant longitudinalement et formant des conduits longitudinaux fournissant l'air de formation de mousse vers lesdits trous (32) pour une introduction dans ladite chambre cylindrique (12d) du corps intermédiaire (10).
2. Le dispositif selon la revendication 1, **caractérisé en ce que** l'élément tubulaire externe (40) présente des lumières (41) au niveau de son extrémité basse favorisant l'introduction de l'air de formation de mousse.

3. Le dispositif selon la revendication 2, **caractérisé en ce que** lesdites lumières sont allongées dans la direction longitudinale.
4. Le dispositif selon la revendication 1, **caractérisé en ce que** ledit corps cylindrique supérieur (40) peut se voir associé à des moyens (21a) pour sa connexion à différentes sources d'alimentation (22a, 22b) de façon à alimenter le dispositif en vapeur pour le réchauffement du liquide ou en eau pour le lavage interne du dispositif lui-même.

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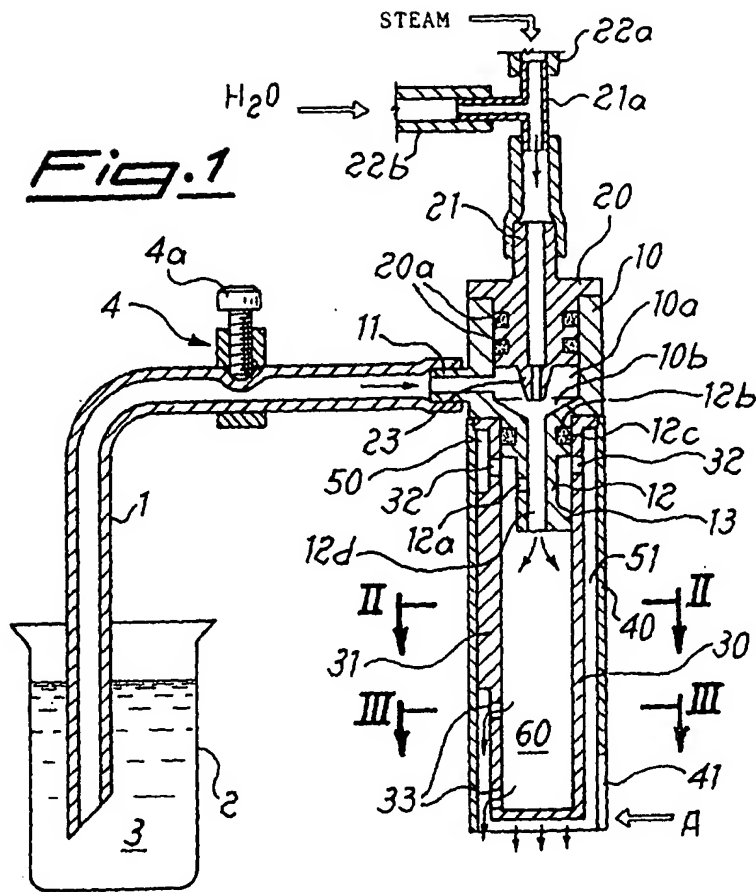
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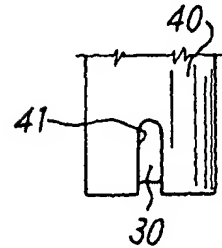
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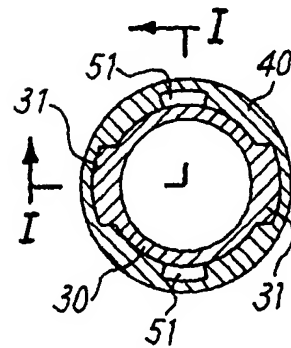
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**Fig. 1a**



**Fig. 2**



**Fig. 3**

